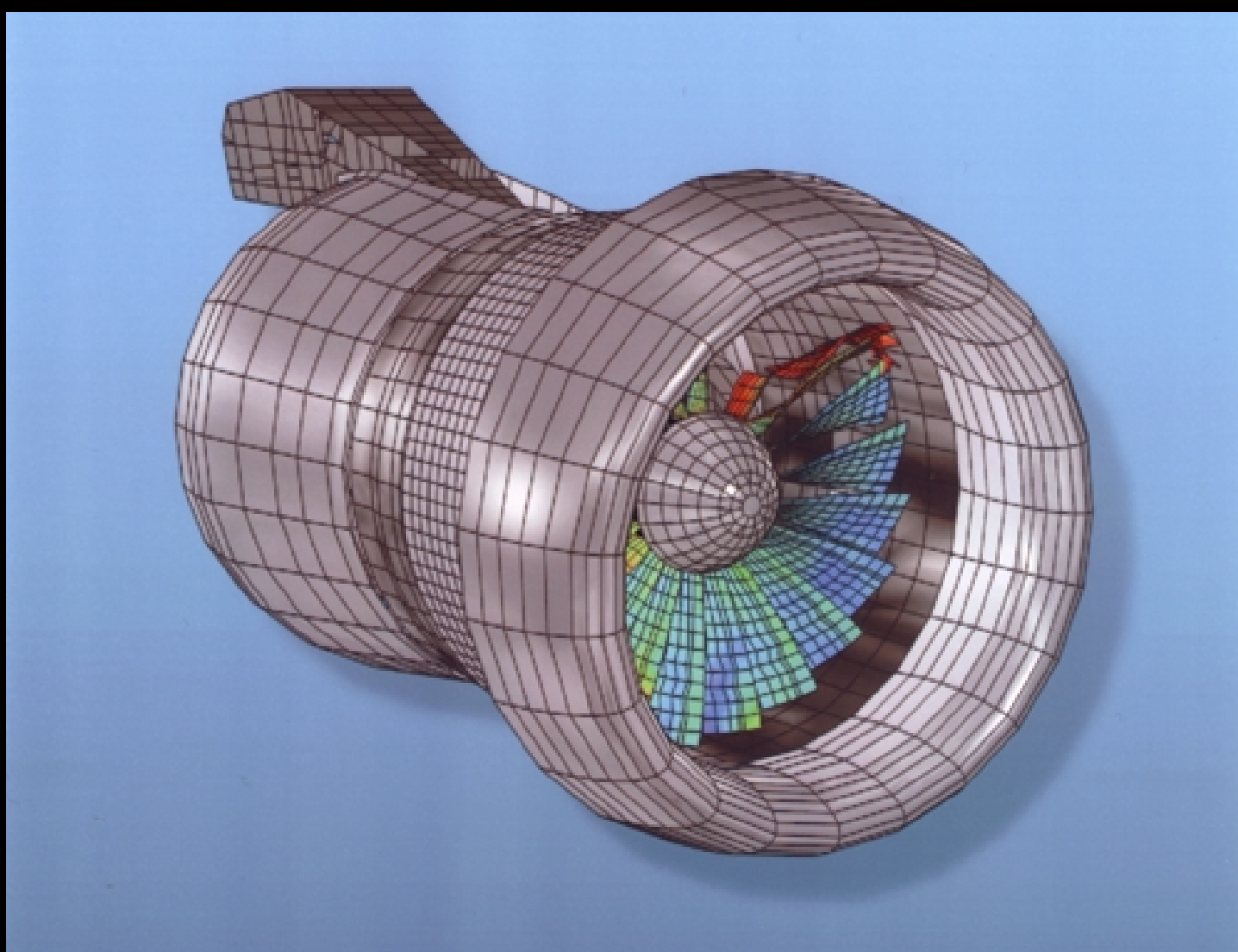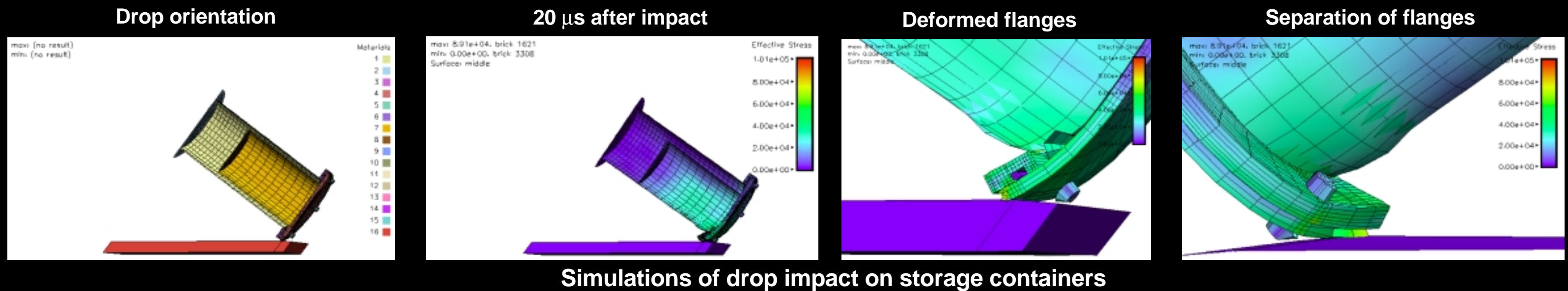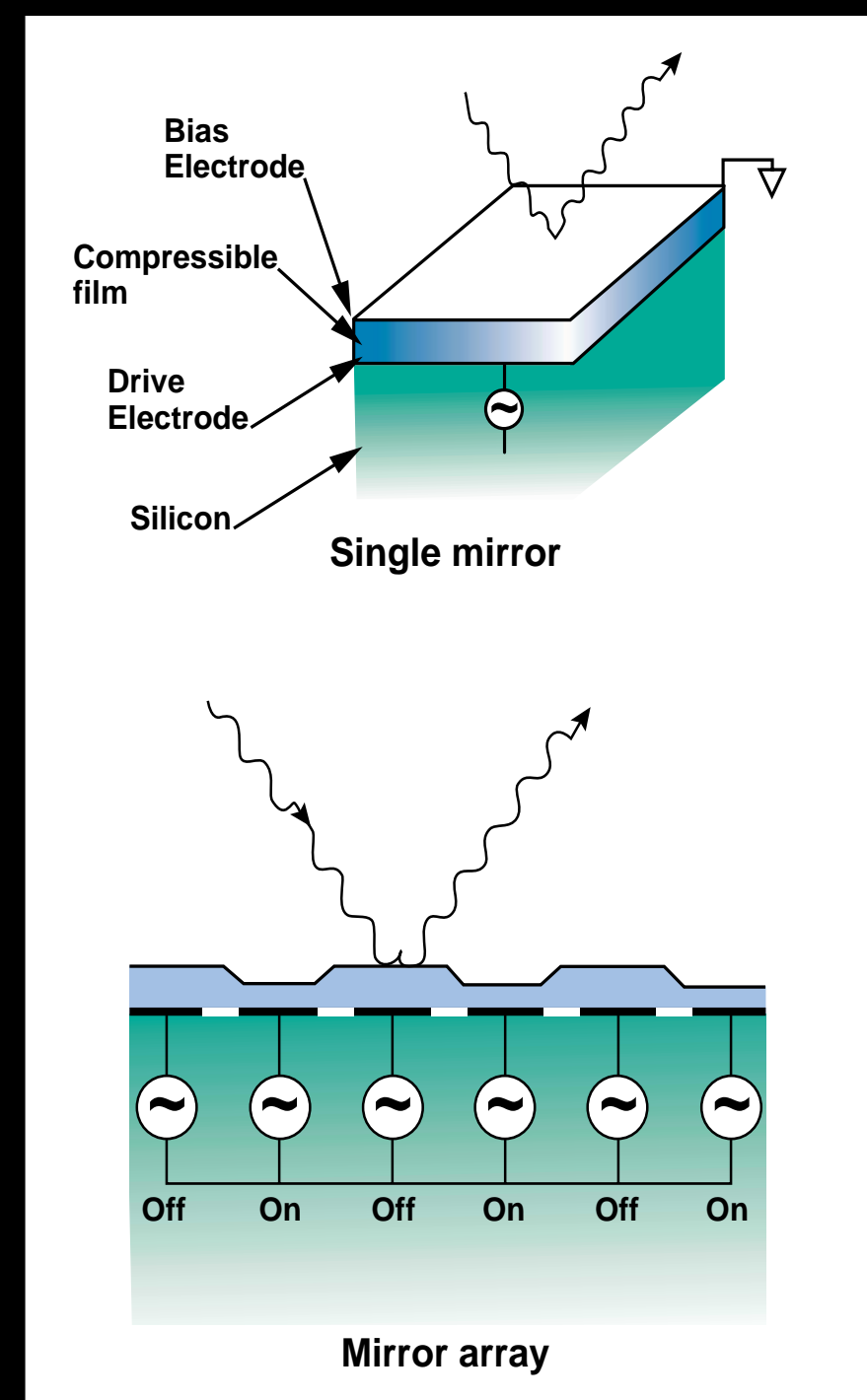# Computer Simulations:
Solving Problems of National Importance

The Structural and Applied Mechanics Group (SAMG) is applying advanced computer simulations to help solve problems of national importance. Examples include the deformation of storage containers, jet engine blade failure, and applications related to lithography and adaptive optics.

Drop orientation

20 μs after impact

Deformed flanges

Separation of flanges

Simulations of drop impact on storage containers

We are using computer simulations to predict airplane responses to jet engine blade failures. The effect of both contained and uncontained engine debris is being considered.

Single mirror

Bias Electrode

Compressible film

Drive Electrode

Silicon

Mirror array

Off On Off On Off On

Electrostatically driven microfabricated mirror array controls the phase or amplitude of light in applications such as lithography or adaptive optics.

Continuum computer simlutions

$$[\sigma] = f(\varepsilon, \dot{\varepsilon}, T, P)$$

t = 12 μsec

Mesoscale

1 mm

ALE3D Virtual test sample

Single crystal constitutive relation

Microscale

15 μm

Rules for dislocation, motion, and multiplication

Atomistic scale

First-principles simulation

LLNL'S multiscale modeling approach involves simulations at different length scales, where "bridging of the length scales" is accomplished by carefully defined "information passing," bringing required data from simulations at smaller length-scales into larger length-scale simulations.